

Amendment Under 37 CFR 1.116
Dated December 8, 2003
Serial No. 09/231,271

IN THE CLAIMS

Claim 1. (Currently Amended) A protection arrangement for a line circuit, comprising:

current sensing means for sensing current flowing through the telephone subscriber line;

voltage sensing means for sensing voltage across the telephone subscriber line;

line circuit isolation means for selectively coupling the line circuit to the telephone subscriber line;

power supply isolation means for selectively coupling a power supply to the line circuit;
and

control means for operating the power supply isolation means to decouple the power supply from the line circuit in response to a current sensed by the current sensing means exceeding a current threshold and to a voltage sensed by the voltage sensing means failing to exceed a voltage threshold, and to recouple the power supply to the line circuit responsive to a predetermined time interval having passed.

Claim 2. (Previously Amended) A protection arrangement as claimed in claim 1, wherein the power supply isolation means comprises:

a FET having a source for connecting to the power supply, a drain for connecting to the line circuit, and a gate; and

an interface circuit connected to the source and drain of the FET, having an input connected to the control means, and an output connected to the gate of the FET, the interface circuit for operating the FET in saturation mode to couple the power supply to the line circuit and for turning off the FET to decouple the power supply from line circuit.

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Claim 3. (Original) A protection arrangement as claimed in claim 2, wherein the interface circuit comprises:

a voltage divider having first and second resistors, the first resistor connected to the source of the FET at one end and to the gate of the FET at the other end, and the second resistor connected to the gate of the FET at one end; and

a pnp transistor having a base connected to ground, an emitter coupled to the controller means, and a collector connected to the other end of the second resistor.

Claim 4. (Currently Amended) A protection arrangement for a line circuit comprising—~~as claimed in claim 3, wherein the interface circuit further comprises:~~

current sensing means for sensing current flowing through the telephone subscriber line;

line circuit isolation means for selectively coupling the line circuit to the telephone subscriber line;

power supply isolation means for selectively coupling a power supply to the line circuit;
and

control means for operating the power supply isolation means to decouple the power supply from the line circuit in response to a current sensed by the current sensing means exceeding a current threshold, and to recouple the power supply to the line circuit responsive to a predetermined time interval having passed;

wherein the power supply isolation means comprises a FET having a source for connecting to the power supply, a drain for connecting to the line circuit, and a gate; and an interface circuit connected to the source and drain of the FET, having an input connected to the

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control means, and an output connected to the gate of the FET, the interface circuit for operating the FET in saturation mode to couple the power supply to the line circuit and for turning off the FET to decouple the power supply from line circuit; and

wherein the interface circuit comprises a voltage divider having first and second resistors, the first resistor connected to the source of the FET at one end and to the gate of the FET at the other end, and the second resistor connected to the gate of the FET at one end; a pnp transistor having a base connected to ground, an emitter coupled to the controller means, and a collector connected to the other end of the second resistor, and a zener diode having an anode connected to the source of the FET and a cathode connected to the gate of the FET.

Claim 5. (Original) A protection arrangement as claimed in claim 4, wherein the interface circuit further comprises a capacitor connected to the emitter of the pnp transistor at one end and to the drain of the FET at the other end.

Claim 6. (Original) A protection arrangement as claimed in claim 5, wherein the interface circuit further comprises a resistor that couples the emitter of the pnp transistor to the controller means.

Claim 7. (Currently Amended) A method of protecting a line circuit connected to a power supply and to a telephone subscriber line from an over-current condition, the over-current condition being defined as when current flowing through the telephone subscriber line exceeds a predetermined current threshold value, comprising the steps of:

- a) checking ~~of~~ for a presence of the over-current condition;

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b) starting, responsive to the over-current condition being present, a timer of predetermined duration;

b)(1) checking, responsive to starting the timer and to the over-current condition being present, for a presence of an over-voltage condition, the over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined voltage threshold value;

b)(2) stopping, responsive to the over-voltage condition being present, the timer and continuing the method from the step (a) of checking;

c) disconnecting, responsive to the timer having expired, the line circuit from the power supply;

d) waiting a predetermined amount of time; and

e) reconnecting the line circuit to the power supply.

Claim 8. (Original) A method as claimed in claim 7, wherein the step (b) of starting further comprises the steps of:

checking, after starting the timer, for the presence of the over-current condition; and

stopping, responsive to the over-current condition no longer being present, the timer and continuing the method from the step (a) of checking.

Claim 9. (Cancelled)

Claim 10. (Currently Amended) A method as claimed in claim 9, wherein the step (b) of starting a timer further comprises the steps of:

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checking, responsive to the over-current condition being present and an over-voltage condition not being present, the timer to determine if the timer has expired; and

continuing, responsive to the timer not having expired, the method from the step of checking, after starting the timer, for the presence of the over-current condition.

Claim 11. (Currently Amended) A method of protecting a line circuit connected to a telephone subscriber line and to a separate power supply from an over-voltage condition, the over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined voltage threshold value, comprising the steps of:

- a) checking for a presence of the over-voltage condition;
- b) starting, responsive to the over-voltage condition being present, a first timer of predetermined duration;
- c) disconnecting, responsive to the timer having expired and to the over-voltage condition being present, the line circuit from the power supply and from the telephone subscriber line;
- d) waiting a predetermined amount of time; and
- e) reconnecting the line circuit to the power supply and to the telephone subscriber line;
- f) checking for the presence of the over-voltage condition;
- g) restarting, responsive to the over-voltage condition being present, the first timer;

and

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h) disconnecting, responsive to the first timer having expired after being restarted and to the over-voltage condition being present, the line circuit from the telephone subscriber line.

Claim 12. (Cancelled)

Claim 13. (Currently Amended) A method as claimed in claim ~~12~~11, wherein the step (e) of reconnecting further comprises the steps of:

starting a second timer of predetermined duration after the telephone subscriber interface circuit has been reconnected to the telephone subscriber line; and

continuing, responsive to the second timer having expired and the over-voltage condition not being present, the method from the step (a) of checking.

Claim 14. (Currently Amended) A method as claimed in claim ~~12~~11, wherein the step (b) of starting further comprises the steps of:

checking, after the first timer ~~has~~ has been started, for the presence of the over-voltage condition; and

continuing, responsive to the over-voltage condition not being present and the first timer not having expired, the method from the step (a) of checking.

Claim 15. (Original) A method as claimed in claim 13, wherein the step (g) of restarting further comprises the steps of:

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checking, after the first timer has been restarted, for the presence of the over-voltage condition; and

continuing, responsive to the over-voltage condition not being present, the method from the step of starting a second timer.

Claim 16. (Currently Amended) A method of protecting a line circuit connected to a telephone subscriber line and to a separate power supply from positive and negative over-voltage conditions, the positive over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined positive voltage threshold value and the negative over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined negative voltage threshold value, comprising the steps of:

- a) checking for a presence of the positive over-voltage condition;
- b) checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition;
- c) starting, responsive to the negative over-voltage condition being present, a first timer of predetermined duration;
- d) disconnecting, responsive to the timer having expired and to the negative over-voltage condition being present, the line circuit from the power supply and from the telephone subscriber line;
- e) waiting a predetermined amount of time; and
- f) reconnecting the line circuit to the power supply and to the telephone subscriber line;
- g) checking for a presence of the positive over-voltage condition;

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h) checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition;

i) restarting, responsive to the negative over-voltage condition being present, the first timer; and

j) disconnecting, responsive to the first timer having expired after being restarted and to the negative over-voltage condition being present, the line circuit from the telephone subscriber line.

Claim 17. (Cancelled)

Claim 18. (Currently Amended) A method as claimed in claim 1716, wherein the step (f) of reconnecting further comprises the steps of:

starting, after the telephone subscriber interface circuit has been reconnected to the telephone subscriber line, a third timer of predetermined duration;

checking for a presence of the positive over-voltage condition;

checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition; and

continuing, responsive to the third timer having expired and both positive and negative over-voltage conditions not being present, the method from the step (a) of checking.

Claim 19. (Currently Amended) A method as claimed in claim 1716, wherein the step (c) of starting further comprises the steps of:

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checking, after the first timer has been started, for a presence of the positive over-voltage condition;

starting, responsive to the positive over-voltage condition being present, a second timer of predetermined duration;

disconnecting, responsive to the second timer having expired and to the positive over-voltage condition being present, the line circuit from the telephone subscriber line;

waiting a predetermined amount of time; and

reconnecting the line circuit to the telephone subscriber line.

Claim 20. (Original) A method as claimed in claim 18, wherein the step (i) of restarting further comprises the steps of:

checking, after the first timer has been restarted, for a presence of the positive over-voltage condition;

starting, responsive to the positive over-voltage condition being present, a second timer of predetermined duration; and

disconnecting, responsive to the second timer having expired and to the positive over-voltage condition being present, the line circuit from the telephone subscriber line.

Claim 21. (Original) A method as claimed in claim 20, wherein the step of starting a second timer further comprises the steps of:

checking, after the second timer has been started, for the presence of the positive over-voltage condition; and

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continuing, responsive to the positive over-voltage condition not being present and the second timer not having expired, the method from the step of starting the third timer.

Claim 22. (Original) A method as claimed in claim 20, wherein the step of checking for a presence of the positive over-voltage condition after the first timer has been restarted further comprises the steps of:

checking, responsive to the positive over-voltage condition not being present, for the presence of the negative over-voltage condition; and

continuing, responsive to the negative over-voltage condition not being present and the first timer not having expired after having been restarted, the method from the step of starting the third timer.

Claim 23. (Original) A method as claimed in claim 16 wherein the step (c) of starting further comprises the steps of:

checking, after the first timer has been started, for the presence of the negative over-voltage condition; and

continuing, responsive to the negative over-voltage condition not being present and the first timer not having expired, the method from the step (a) of checking.